coast, river-shore, and hill-side, in the belfry at Ross, by Dean Gainsford's grave—phenomena which others overlooked or passed as trivial were by him pounced upon and analysed and made to bear fruit in discovery and correlation and historical association and practical scientific use. Of human prodigies in every department he was the recognised Proxenus and patron. Miss Swann the giantess and her husband Captain Bates the giant, and the Two-headed Nightingale, and the Siamese Twins, and the New Zealand Chiefs, and Fatima, and Zariffa, and Julia Pastrana the hairy woman, and Benedetti the sword swallower, and the Wild Man of the Woods, and the man who could sing two notes at once, and the man who could drink a bottle of milk under water,—all looked up to him as a father, or sat as guests at his table. He came by degrees to be accepted as an *Arbiter monstrorum*; as the necessary referee whenever any strange revelation or any novel puzzle presented itself in the world of nature. If a whale ran on shore at Gravesend, or a dolphin at Herne Bay; if an unusual sturgeon or tunny was consigned to a London fishmonger; if the lawyers at Nisi Prius were at issue whether a hole in a ship's bottom could have been made by the beak of a swordfish, or the Gloucester Magistrates hesitated over the identity of elvers with young eels; if a sick porpoise arrived at the Zoological Gardens in a condition requiring brandy and water to be exhibited internally and caustic applied without; if the Chief Rabbi felt searchings of heart as to whether oysters might for edible purposes be inserted in the Mosaic catalogue of things that creep; if a sea-lioness were ill in the Aquarium, or a plague of frogs occurred at Windsor; if search were required for John Hunter's coffin in St. Martin's Church, or the skeleton of William Rufus had to be exhumed in Winchester Cathedral,—it was inevitable that Frank Buckland should be telegraphed for first of all. And the influence he exerted was often highly beneficial. To his interference we owe the close time for seals and the Bill for the preservation of marine birds. A description in *Land and Water* of a neglected Museum at Canterbury shamed the Curator into setting it to rights; his good-humoured criticism, from a naturalist's point of view, of the pictures in the Royal Academy, taught the artists beneficially that an eye as keen as Ruskin's was noting their performances in a region beyond Ruskin's reach.

His home in Albany Street was one of the sights of London; but to enter it presupposed iron nerves and a stomach like those of Horace's reapers. Iron nerves—for, introduced at once to some five-and-twenty poor relations, exempt from shyness and deeply interested in your dress and person, to Jacko, and the Hag, and the Nigger, and Jenny, and Tiny, and the parrot and the jaguar, and the laughing jackass, and Jemmy the suricate, and Dick the bear, and Arslan the Turkish wolf-dog, you felt, like Jaques in the play, as if another flood were toward, and the animals were parading for admission. Dura ilia—for the genius of experiment, supreme in all departments of the house, was nowhere so active as at the dinner-table. We read of panther chops, rhinoceros pie, bison steaks, kangaroo ham, horse's tongue, elephant's trunk; of whale boiled with charcoal to refine the flavour; of tripang and lump-fish; of stewed whelks and land-snails, roasted hedgehog, potted ostrich. We notice in the diary such entries as "seedy from lump-fish;" "very poorly indeed, effects of horse;" and we sympathise with a departing guest who notes—"tripe for dinner—don't like crocodile for breakfast."

He was the Samson of science; the "Sunny One" amongst *savants*, as was Manoah's son amongst judges; roars of genial laughter accompany the heroism and the feats of both. But the comic recollections which surround him ought not to mask the serious admiration which is his due;—first, as a public teacher, circulating popular science, generating field clubs and microscopical societies, preparing a public to appreciate and to support the more purely scientific labourer; secondly, as a material benefactor, raising in fifteen years the commercial value of English and Scottish salmon to the extent of 100,000*l.* per annum; thirdly, as having in a manner rare, if not unique, passed behind the veil which hangs between us and the animal creation. He understood their gestures and expressions as we interpret those of one another, and they understood him in their turn; the creatures at the Gardens, the beasts at Jamrach's, the pets at home, seemed to know him in a human fashion; his dying words—"God is so good to the little fishes that I do not think He will let their inspector suffer shipwreck at the last"—show his identity of feeling with them; no one could talk to him long without a strangely new and reverential sense of brotherhood with these existences who were to him so entirely fraternal as people of his Father's pasture and sheep of his Father's hand. Science has had very many greater sons; none more simple, modest, blameless; none more genial, more humane, or more beloved.

W. TUCKWELL

COMPENSATION OF COMPASSES

Practical Guide for Compensation of Compasses without Bearings. By Lieut. Collet, French Navy, Tutor in the Polytechnique School of France. Translated by W. Bottomley. With a Preface by Sir W. Thomson, F.R.S., &c. (Portsmouth: Griffin and Co., 1885.)

THIS work appears in its English garb under the auspices of Sir W. Thomson.

In the published instructions for the adjustment of his patent compass, Sir William Thomson gives short directions for the use of the deflector, an instrument to facilitate correcting that compass by magnets and soft iron when neither bearings of sun nor terrestrial objects can be obtained. With this deflector a fog is not the unwelcome visitor it generally is, for with the fog there is often a smooth sea, a condition favourable to a successful use of this delicate instrument.

As an invention of Sir W. Thomson it is certain that the inquirer into the use of the deflector will at once be disposed to look for an instrument theoretically correct in conception and of great refinement in construction. The useful work of fully describing the practical applications and several uses of this instrument has, however, been left to an able writer on subjects connected with the compass in iron ships—Lieut. Collett, of the French Navy—and the book now under review is the result.

It may be remarked that Sir W. Thomson, in the preface, fully recognises it as a complete and able exponent

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of the uses of this deflector, which is an important point to those desirous of using the instrument.

In four chapters of his Practical Guide M. Collet has given, in detail, practical rules for correcting the errors of the compass without bearings, illustrated by numerous examples, and including instructions for the graduation of the deflector, or measuring the magnetic force for each division of its scale. Collected in a tabular form, the results of this graduation will be found of great use to observers, and of the five advantages arising from it enumerated by the author, not least is that which gives an approximate value of the coefficients of deviation. This would prove useful when the observer, wishing to leave the magnets undisturbed, required only to know if any change of deviation had taken place.

Another advantage of this graduation is that it forms an additional method of measuring the diminution of the mean directive force of the compass on board ship as compared with that on land, or the term λ of the text-book. λ is a necessary element in the exact correction of the heeling error—a part of the correction to which the author devotes a chapter, as it rightly comes under the denomination of a compensation requiring no bearings.

Lieut. Collet, in his introductory chapter and elsewhere, strongly urges that the deflector, concerning the uses of which he has written so fully, should in the immediate future become the chief instrument used in the compensation of compasses, on account of the rapidity and sufficiency of precision with which it may be made, and that it be adopted for frequent if not daily use on board ships at sea. Before remarking on this proposal it may be as well to inquire into the present customs with regard to the standard or navigating compass at the time of its first compensation and subsequent changes of deviation.

In the Royal Navy the adjustment of compasses is invariably made by bearings, and the instances are rare when the adjustments of the standard compass alone, including the final swinging of the ship, occupy more than an hour or two with results absolutely correct. Subsequently to this one adjustment the compensating magnets are not moved during their three or four years' period of service, but the deviations of the compass are carefully observed on all occasions when bearings can be taken—in other words, from day to day—and noted for guidance when bearings cannot be taken. In the Mercantile Marine a large number of ships are fitted with Sir W. Thomson's standard compass with the accompanying magnets adjustable at pleasure. This compass is often compensated by experts in the use of the deflector and the magnets left in a given position.

Now, what is the almost universal practice of the commanders of these vessels subsequent to this adjustment by means of the deflector? They observe the deviation frequently by day and night when possible, note the results in a compass journal for present and future guidance, and object most strongly to any alteration of the magnets.

In the paragraph headed "Weather" it will be seen that a moderately smooth sea is required when using the deflector, and in another place it will be seen that it is no certain guide to navigation unless observations are made on all the cardinal points. The question therefore arises, Are the necessary conditions for using this instrument often available in the North Atlantic and "roaring forties," when bearings are at times unobtainable for some days?

The result of the foregoing consideration is to show that there is long custom of very practical men—and possibly prejudice—to overcome before Lieut. Collet's future of frequent use of compensation without bearings becomes general.

The nautical world has had the deflector as invented by Sir W. Thomson before it for some years; it now has an excellent practical guide to its use in the book under review, and it remains to be seen how far that world will avail itself of the invention.

It may probably suggest itself to some minds that the book would lose none of its value by being shortened somewhat in detail; indeed, the shorter the better, if combined with accuracy for the practical navigator, and should a new edition be required the translator who has done his part well, and knows the deflector thoroughly, will perhaps try his hand at the work of condensation.

THE FORBES MEMORIAL VOLUME

In Memoriam. The collected Scientific Papers of the late William Alexander Forbes, M.A., Fellow of St. John's College, Cambridge, Lecturer on Comparative Anatomy at Charing Cross Hospital, Prosector to the Zoological Society of London. Edited by F. E. Beddard, M.A., Prosector to the Zoological Society of London. With a preface by P. L. Sclater, M.A., Ph.D., F.R.S., Secretary to the Zoological Society of London. (London: R. H. Porter, 1885.)

THE death of Alfred Henry Garrod at the early age of thirty-three was a great misfortune to the cause of zoology in this country. But that his distinguished successor, William Alexander Forbes, a man full of vigour and in the best of health, should have suddenly succumbed to the influence of a pernicious climate at the age of twenty-eight, was perhaps a still more severe blow, and one that will long be felt by the naturalists of the present day. We do not seek to compare Forbes with Garrod, but it must be recollected that Forbes was a man of undoubtedly strong physique, for whom there was every prospect of a long and successful career. There can be not the slightest doubt that, had he not lost his life from the accidental force of circumstances, Forbes would have left a considerable mark on the progress of science. As regards natural history at least, if not in some other matters, Forbes was a universal genius. Of the whole zoological series he had an enormous knowledge, ranging from one end of the animal kingdom to the other. Possessed of a most retentive memory and of an abundant stock of energy, he was unremittingly at work on his favourite subject, and never forgot what he had acquired either by reading or by experience. Not only was he thoroughly up in zoological literature, but he was also an accurate observer and a diligent collector in the field, where nothing came amiss to him. Mammals, birds, butterflies, and beetles were perhaps the groups which he knew best; but Forbes had, as already stated, an excellent general knowledge of the whole animal series. Whatever novel object might be shown to him he was very rarely at a loss for its

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